

# **2000 South Dakota Statewide Seatbelt Survey**

## **Final Report**

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by

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## **South Dakota Statewide Seatbelt Survey Fall, 2000**

Motor vehicle injuries and fatalities continue to be a major health concern in the United States. The National Highway Transportation Safety Administration (NHTSA) reports that traffic injuries are the leading cause of injury-related deaths for all age groups and are the leading cause of death for persons aged 6 to 27 years. To illustrate this point further, the NHTSA estimates that every 14 seconds someone in America is injured in a motor vehicle crash and that every 12 minutes a vehicle-related fatality occurs.

Research has clearly shown that use of a safety restraint significantly decreases the severity of injuries in a motor vehicle crash and in particular decreases both the incidence and severity of potentially fatal closed head injuries (Norris, Matthews, & Riad, 2000). According to the NHTSA, deaths and serious disabilities caused by motor vehicle crashes could be reduced by approximately 50% with the use of safety belts and child restraint devices. Seatbelts are estimated to save 9,500 lives in America each year. Research has found that lap/shoulder belts, when used properly, reduce the risk of fatal injury to front seat passenger car occupants by 45% and the risk of moderate-to-critical injury by 50%. Yet, NHTSA records indicate that fewer than 40% of both adults and children who die in traffic crashes are properly restrained.

In recognition of the important role that seatbelts play in reducing the motor vehicle accident severity rates, a nation wide campaign aimed at increasing the use of seatbelt and child safety restraint use has been initiated. The national health objective for the year 2000 set an aggressive goal of increasing safety restraint usage for motor vehicle occupants to a rate of 85% (NHTSA, 2001; Clark, Schmitz, Conrad, Estes, Healy, & Hitibidal, 1999). However observation data tabulated to date indicate that the nationwide usage rate fell well below these goals. The NHTSA using data from the National Occupant Protection Use Survey obtained in the Fall of 2000 estimates that shoulder belt use for front seat passengers in the United States during the Fall of 2000 was 71% overall, with an average rate of 77% in states that have standard (primary enforcement) seatbelt laws and a rate of 64% in states without standard enforcement laws.

These facts and figures emphasize the importance of safety restraint usage at the local level. In response to this initiative, the South Dakota Office of Highway Safety commissioned associates of the Human Factors Laboratory (HFL) at the University of South Dakota to conduct a probability-based survey of seatbelt use in the state in 1998 and in 2000. The purpose of these studies was to document the level of seatbelt use in a sample of drivers and front seat passengers traveling in noncommercial vehicles on South Dakota roads in November of 1998 and November of 2000. The methods and procedures developed and implemented in the 1998 study resulted in a systematic procedure that: a) could be replicated in future investigations; and, b) would establish a

base rate of current seat belt use that could be compared to future investigations as a means of evaluating programmatic efforts aimed at increasing usage rates.

This report presents the methods, procedures and results of the 2000 Statewide Seatbelt Survey. As indicated, the methods used in the 2000 study were based in large part on those established in the 1998 survey. Modifications to the 1998 survey design are indicated along with a rationale for their inclusion in the 2000 survey. Results of the 2000 survey are presented followed by a discussion of the general trends observed in usage rates and implications for future surveys and public safety programming.

### **Methods**

The methods used in this study were designed and conducted according to federal guidelines established by NHTSA and as implemented in the previous 1998 Statewide Seatbelt Survey. The methods and procedures described below are in compliance with the "Uniform Criteria for State Observational Surveys of Seat Belt Use", published in the Federal Register on September 1, 1998 (63 F.R. 463389). One modification to the design of this survey was implemented in an effort to increase the observational rate for children under the age of 5 years.

### **Survey Design: Stage 1**

This study utilized the geographic sampling techniques and road segment sites established in the 1998 survey. These road segment sites were established in 1998 based on the following process. The first step was to select geographic areas for sampling of traffic. South Dakota is a state with less than 800,000 citizens residing in 66 counties. The population is not evenly distributed throughout the state, as 50 % of the citizens live in eight counties with urban centers. Many of the remaining 58 counties have low populations residing in largely rural areas. Because it is difficult to sample traffic in all areas of a state with a low population, a "multi-stage cluster approach" was utilized. In this plan recommended by NHTSA guidelines, sampling can be restricted to the counties that account for 85 % of the state's population. Therefore, the sampling pool was comprised of the 33 largest counties in South Dakota that account for 85 % of South Dakota's population. Table 1 shows the eligible counties in ascending order according to population size.

**Table 1: Largest South Dakota Counties Accounting for 85% of the State Population.**

<b>County</b>	<b>Population</b>	<b>% of</b>	<b>Cumulative %</b>
1-33			14.44%
34 Dewev	5,668	0.77%	15.21%
35 McCook	5,686	0.77%	15.98%
36 Kingsbury	5,830	0.79%	16.77%
37 Day	6,421	0.87%	17.64%
38 Moody	6,538	0.89%	18.53%
39 Tripp	6,883	0.93%	19.46%
40 Custer	6,966	0.94%	20.40%
41 Fall River	7,123	0.97%	21.37%
42 Bon Homme	7,677	1.04%	22.41%
43 Spink	7,700	1.04%	23.45%
44 Grant	8,048	1.09%	24.54%
45 Hutchinson	8,102	1.10%	25.64%
46 Turner	8,633	1.17%	26.81%
47 Butte	8,926	1.21 %	28.02%
48 Todd	9,296	1.26%	29.28%
49 Charles Mix	9,493	1.29%	30.57%
50 Roberts	9,973	1.35%	31.92%
51 Lake	10,647	1.44%	33.36%
52 Union	11,959	1.62%	34.98%
53 Shannon	12,010	1.63%	36.61%
54 Clay	15,370	2.08%	38.69%
55 Hughes	15,404	2.09%	40.78%
56 Beadle	17,976	2.44%	43.22%
57 Davison	18,807	2.55%	45.77%
58 Lincoln	20,152	2.73%	48.50%
59 Yankton	21,013	2.85%	51.35%
60 Meade	21,999	2.98%	54.33%
61 Lawrence	22,131	3.00%	57.33%
62 Codington	25,452	3.45%	60.78%
63 Brookings	26,186	3.55%	64.33%
64 Brown	35,701	4.84%	69.17%
65 Pennington	87,190	11.81%	80.98%
66 Minnehaha	140,518	19.04%	100.00%
Total	737,9733	100.00%	

Following NHTSA guidelines, a sample of 13 counties could be drawn for a state with at least 85% of the population residing in 30 - 39 counties. The two largest counties in the state were selected and the remaining 11 counties were randomly drawn. Table 2 lists the counties that were selected and their corresponding populations.

**Table 2: Selected Counties and Their Populations**

<b>County</b>	<b>Population</b>
1. Minnehaha	140,518
2. Pennington	87,190
3. Brown	35,701
4. Lawrence	22,131
5. Davison	18,807
6. Beadle	17,976
7. Hughes	15,404
8. Union	11,959
9. Charles Mix	9,493
10. Grant	8,048
11. Fall River	7,123
12. Tripp	6,883
13. Kingsbury	5,830

Although Hutchinson County was initially drawn for the sample, it was learned that the county would be undergoing a local seatbelt survey in the fall of 1998. Therefore, Tripp County was substituted.

### **Survey Design: Stage 2**

The second stage of the study was to select the sample of road segments to be surveyed within the thirteen counties. According to NHTSA guidelines, road segments must be drawn from roads that have an adequate level of traffic based upon Vehicle Miles Traveled (VMT) estimates. Initially, it was estimated that there were an average number of 50 road segments available for sampling in the South Dakota counties. According to the NHTSA guidelines, 19 road segments can be sampled from a base of 50 road segments per county.

However, assessment of 1998 VMT estimates for South Dakota roadways revealed that only an average number of 27 road segments were available for sampling in the 13 counties. (Relative to other states, South Dakota has a limited number of roadways for which VMT estimates are recorded.) Therefore, permission was received from the regional survey design advisor to sample 17 or fewer road segments per county.

In order to select the road segments, maps of roadways and VMT estimates per roadway segments for the 13 counties were obtained from the South Dakota Department of Transportation, Division of Planning and Engineering. Roadways were divided into four classifications:

- urban interstate
- urban highway -- principal and minor highways within designated urban areas (5,000 + population)
- rural interstate
- rural highways -- principal and minor highways outside of urban areas.

Following recommendations from the regional survey design advisor, road segments for urban interstate and urban highways were measured in one mile units, whereas road segments for rural interstate and rural highways were measured in ten mile units. VMT estimates were calculated for each road segment chosen. Road segments with unacceptably low VMT estimates were excluded. Once all of the roadways in a county were divided into eligible segments, a random numbers program was used to select 17 segments for sampling.

The random selection procedure was restricted by the roadway classification of a segment so that the number of segments chosen would be proportionate to the total VMT traveled on a roadway type for that county. For example, in Minnehaha County, the proportions of total vehicle miles traveled by roadway type were:

- 23% for urban interstate
- 43% for urban highways
- 25% for rural interstate
- 10% for rural highways.

Therefore, the drawing of selected road segments was restricted to:

- 4 urban interstate sites (about 23% of 17 sites)
- 7 urban highway sites (about 43% of 17 sites)
- 4 rural interstate sites (about 25% of 17 sites)
- 2 rural highway sites (about 10% of 17 sites).

The procedure described above was applied individually to the 13 counties for final selection of the 17 road segments. Five counties (Brown, Davison, Grant, Kingsbury, and Tripp) had only 13 to 16 road segments chosen because of a limited number of roadways with VMT data available.

The last step in the road segment selection process was to designate a seatbelt observation site within each of the 205 selected road segments. Whenever possible, the observation site was placed at an intersection in which vehicles slowed or stopped for a traffic signal or sign. This allowed for accurate and safe viewing of seatbelt use by the Observers. See Appendix A for a list of the observation sites by mile marker and probability of selection in counties by the four roadway types.

### **Sampling Time Periods**

Six 90-minute blocks of daylight time were scheduled for seatbelt observations. One observation time period was 40 minutes. Including travel time, six sites could be observed in a single day. A county could therefore be surveyed in a four-day period. To minimize travel time and distance required to conduct the survey, sample sites were grouped into geographic clusters. A day of the week to begin data collection was assigned to a cluster. Within a cluster, each road segment was randomly assigned to the available time slots. The time blocks were:

- 1) 7:30AM- 9:00AM
- 2) 9:00AM- 10:30AM
- 3) 10:30AM- 12 noon
- 4) 12noon- 1:30PM
- 5) 1:30PM- 3:00PM
- 6) 3:00PM - 4:30PM

### **Sample Size**

Based on previous observational surveys in South Dakota, it was estimated that approximately 10,000 vehicle observations would be collected from the 205 sites. This sample size allows one to be 95% confident that the numbers reported would be within 1% of the actual values -- an acceptable margin of error according to NHTSA guidelines.

### **Data Collection**

The 1998 data collection form was modified to reflect the inclusion of additional child passengers between 0-4 years of age. A copy of this modified form is included on the last page of the Observer's manual in Appendix B. The data collection form was designed for recording seatbelt use (yes or no) by front seat drivers and right-side passengers of each vehicle observed in the survey. The modified form also included instructions for recording additional front seat passengers and back seat passengers who were under the age of five years. The form allowed collection of other information of interest to the South Dakota Office of Highway Safety, including child restraint use for all passengers who appeared to be under age five, estimated age of drivers and passengers, vehicle type, and in- or out-of-state license plate of the vehicle. Demographic data were also collected for each vehicular observation period including county, site number, time of day, date, observer initials, and roadway type. Data were collected for all passenger cars, pickups, vans, and sport utility vehicles observed. Commercial trucks and motor homes were excluded.

### **Observers, Observation Procedures, and Observer Training**

Two Observers were assigned to a county. Nearly all of the observers were members of a retired citizen group who have a background in driver education. Members of this group have been found to be accurate and motivated Observers of seatbelt use in previous surveys. Additional observers were recruited from the community. Observers received (1) a list of observation sites and a description and maps of the site locations for

their respective counties, (2) a four-day schedule for completing a 40-minute observation period of each site in their county, and (3) an instruction manual explaining how to conduct roadside observations. In addition, the Office of Highway Safety issued Observers safety vests and clipboards. Observers received training through a series of telephone conference calls with the HFL investigators. They were instructed to read the manual and engage in a practice period using local traffic. After the practice period, Observers received a final call from the investigators to review procedures.

Observers were instructed to follow their observation schedules as closely as possible. In the event that Observers could not complete a scheduled site due to weather or complications, they were instructed to call the HFL investigators for reassignment of that site. Observers were asked to stand or park in a safe viewing place when they reached an observation site. They were to station themselves so that they could view traffic traveling in a pre-designated direction on the pre-designated roadway. Observers were instructed to monitor every vehicle if the traffic flow was regular or light, and every other vehicle if the traffic flow was heavy. Observers monitored traffic for 40 minutes of the 90 minute observation period, and used the remaining minutes for travel time and location of a safe observation point.

Observers in Union County failed to complete all road site segments. Therefore one of the investigators completed road site observations for Union County in December of 2000. Observers in Pennington County failed to complete 6 of the 17 road sites.

The data collection procedures are explained in detail in the "Observer Manual - 2000 South Dakota Seatbelt Survey" in Appendix B.



### Results

A total of 12,983 observations were made from the 13 selected counties. Of these, 12,977 observations include data on seatbelt restraint use. Note a small percentage of observations cannot be included in individual analyses due to missing data. Table 3 presents a summary of unweighted data regarding overall seatbelt restraint use in each

**Table 3: Restraint Use by County**

<b>County</b>	<b>Restraint Used</b>		<b>Total</b>
	<b>Yes</b>	<b>No</b>	
<b>Minnehaha</b>	800 (57.1%)	600 (42.9%)	1400
<b>Pennington</b>	412 (42.7%)	552 (57.3%)	964
<b>Brown</b>	813 (59.5%)	553 (40.5%)	1366
<b>Lawrence</b>	1628 (72.6%)	613 (27.4%)	2241
<b>Davison</b>	640 (52.4%)	582 (47.6%)	1222
<b>Beadle</b>	507 (55.8%)	402 (44.2%)	909
<b>Hughes</b>	266 (36.2%)	468 (63.8%)	734
<b>Union</b>	698 (61.1%)	444 (38.9%)	1142
<b>Charles Mix</b>	171 (23.6%)	554 (76.4%)	725
<b>Grant</b>	210 (45.7%)	250 (54.3%)	460
<b>Fall River</b>	218 (51.5%)	205 (48.5%)	423
<b>Tripp</b>	178 (30.1%)	414 (69.9%)	592
<b>Kingsbury</b>	300 (37.5%)	499 (62.5%)	799
<b>Total</b>	6841	6136	12977
<b>% of Total</b>	(52.7%)	(47.3%)	(100%)

county as well as the total number of observations per county. Note that of the 12,977 motorists for which seatbelt use was recorded, 6841 or 52.7% were wearing shoulder safety restraints or were placed in a child restraint while 6136 or 47.3% were not wearing safety restraints. Note that restraint use was recorded as the observed presence of a shoulder harness. Using the presence of a shoulder strap to indicate seatbelt restraint

usage has been demonstrated in previous research to result in the highest accuracy rate as compared to other existing methods. The coding of a child restraint was used if a child was seated in a restrained child safety seat regardless of whether or not a shoulder restraint securing the child safety seat was in view.

#### Estimate of Statewide Seatbelt Use

The statewide estimate of seatbelt use was obtained by finding the percentage of seatbelt use for each site, and then computing a weighted mean for each road type for each county. Then, a weighted average for each road type across counties was found where the weights were the VMT (vehicle miles traveled) for that county on that road type and the sampling weight for the county based on the probability of its selection to be included in the survey. Finally, the estimates for the four road type averages were weighted by the VMT for each road type for the entire state. The resulting estimate for seatbelt use on all South Dakota roads 53.4%, with a standard deviation of 0.502. Thus, it can be said that there is a 95% probability that the true rate of seatbelt use for South Dakota roads ranges between 52.37% and 54.34%. The formulas and weights for calculating the statewide estimate and standard deviation are in Appendix C.

#### Seatbelt Restraint Usage by County

As illustrated in Table 3, seatbelt use was highest in Lawrence County where 72.6% or 1628 of the 2241 motorists observed were wearing safety restraints. Union County had the next highest rate of seatbelt use with 61.1% or 698 of the 1142 motorists observed wearing a safety restraint. Seatbelt use was lowest in Charles Mix County where only 23.6% or 171 of the 725 motorists observed were wearing a safety restraint. The next lowest rate of restraint use observed was in Tripp County where only 30.1% or 178 out of 592 motorists observed were wearing restraints.

Several counties had restraint usage rates in the 50-60% range. Minnehaha had a restraint usage rate of 57.1% or 800 of 1400. Brown had an observed restraint usage rate of 59.5% or 813 of 1366 observed motorists. Davison had a rate of 52.4% or 640 of 1222. Beadle had a rate of 55.8% or 507 of 909 observed motorists. Fall River had a rate of 51.5% or 218 of 423. Pennington and Grant had rates of 42.7% or 412 out of 964 and 45.7% or 210 out of 460 observations, respectively. Kingsbury's rate was 37.5% or 300 of 799 and Hughes's rate was 36.2% or 266 of 734 observed motorists.

#### Age of Motorist

Observers estimated the age of drivers and front seat passengers to the best of their ability. In a limited number of cases the observer was unable to determine age. These few instances are excluded from the following age by restraint use analyses. In an effort to increase the observed recording of children from birth to age 4 years, a new observation protocol was adopted in the 2000 survey. As in the 1998 survey, observers always recorded data for the driver and a right front passenger, irrespective of age. In the 2000 survey, if an additional passenger between 0-4 years of age was present in the front seat (e.g., on the right front passenger's lap or in the middle of the seat), data for this

passenger was also recorded. Data was also recorded for any children between 0-4 years of age riding in the back seat. Again note that data for these additional passengers were only recorded if the additional passengers were 4 years of age or younger.

Child restraint usage was defined as a passenger restrained by a child carrier. If children under the age of 5 years were observed riding in the front seat of a vehicle unrestrained, this was recorded as no restraint used. If a child under five years of age was observed riding in the front passenger seat wearing a shoulder restraint but not seated in a child carrier, then restraint use was recorded as a yes. Note however, that according to South Dakota law, all children under the age of 5 years should be restrained in an approved child safety restraint unless they weigh more than 40 pounds. Table 4 illustrates the total number of observations and restraint use by each age group including the use of child restraints.

The new observation protocol resulted in observation of a total of 161 children between 0-4 years of age. Of these 161 children 32.9% or 53 out of 161 were observed to be wearing a child restraint. Another 26.1% or 42 were wearing a shoulder restraint, but not seated in a child safety seat and the remaining 41.0% or 66 were not wearing any type of safety restraint.

A total of 117 children between the 5-13 years of age were observed. Slightly more than half of the children in this age group were wearing some type of safety restraint. Of the 117 children in this age group observed, 51.3% or (60/117) were observed to be wearing a seat belt, while 44.4% or (52/117) wear not restrained. An additional 5 of the 117 children (4.3%) were seated in a child safety seat.

A total of 374 motorists were estimated to be in age category of 14 to 17 years of age. Of these 374, 186 or 49.7% were wearing a safety restraint and 188 or 50.3% not wearing a seatbelt. Note that this usage rate is higher than the observed rate for 1998 in which usage rate was at 41.1% (147/358).

**Table 4: Restraint Use by Age**

Age	Restraint Used		Child Restraint	Total
	Yes	No	Yes	
<b>0-4 years</b>	42 (26.1%)	66 (41.0%)	53 (32.9%)	161
<b>5-13 years</b>	60 (51.3%)	52 (44.4%)	5 (4.3%)	117
<b>14-17 years</b>	186 (49.7%)	188 (50.3%)	0	374
<b>18 &amp; over</b>	6449 (53.2%)	5663 (46.8%)	0	12,112
<b>Total</b>	6737 (52.8%)	5970 (46.8%)	58 (.5%)	12,764

A total of 12,112 motorists were estimated to be in the age group of 18 years and older, which comprised the overwhelming majority of observations. Of these 12,112 observations, 6449 (53.2%) were wearing a restraint and 5663 or 46.8% were not wearing a restraint.

**Table 5: Restraint Use by Age in the 1998 Survey**

Age	Restraint Used		Child Restraint	Total
	Yes	No	Yes	
<b>0-4 years</b>	10 (33.3%)	11 (36.7%)	9 (29%)	30 (.3%)
<b>5-13 years</b>	45 (39.5%)	60 (52.6%)	9 (7.9%)	114
<b>14-17 years</b>	147 (41.1%)	211 (58.9%)	0	358 (3.1%)
<b>18 &amp; over</b>	4791 (43.8%)	5663 (56.2%)	0	10,933 (95.6%)
<b>Total</b>	4993 (43.7%)	6424 (56.2%)	18 (.2%)	11,435 (100%)

#### Drivers versus Passengers

According to guidelines discussed previously, data were recorded for all drivers and right front seat passengers. Data for additional passengers were only recorded if the additional passenger was under the age of 5 years (0-4 years).

Data for restraint use by occupant position in the vehicle is presented in Table 6. Note that restraint use was similar for both drivers and passengers. Of the 9881 drivers observed, 5109 or 51.7% were observed wearing safety restraints while 4772 or 43.3% were not wearing restraints. Of the 2941 right front seat passengers observed, 1631 or 55.5% were wearing shoulder restraints, with an additional 12 or .4% in a child safety seat. A total of 1298 or 44.1% were not wearing a safety restraint.

**Table 6: Restraint Use for Drivers versus Passengers.**

<b>Occupant Type</b>	<b>Restraint Used</b>		<b>Child Restraint</b>	<b>Total</b>
	<b>Yes</b>	<b>No</b>		
<b>Drivers</b>	5109 (51.7%)	4772 (48.3%)	0	9981
<b>Right-Front Passengers</b>	1631 (55.5%)	1298 (44.1%)	12 (.4%)	2941
<b>Additional Child Front Passenger</b>	22 (32.8%)	32 (47.8%)	13 (19.4%)	67
<b>Child Passenger Back Seat</b>	21 (24.1%)	33 (37.9%)	33 (37.9%)	87
<b>Total</b>	6783 (52.3%)	6135 (47.3%)	58 (.4%)	12976

### Vehicle Type

Only non-commercial vehicles were included in the observations. Vehicles were categorized into three classifications. The first classification was for cars. The second classification was designated vans/pickups and also included mini-vans and station wagons. The third classification was for Sport Utility Vehicles (SUVs). Table 7 presents a summary of data regarding restraint use in each vehicle category. The ratio of restraints worn per motorist is considerably higher in categories of cars and Sport Utility Vehicles (3507 out of 6072 or 57.8% for motorists in cars and 875 out of 1507 or 58.1% in SUVs) than the rate observed for vans/pickups (2401 out of 5398 or 44.5%). Note that this trend was also observed in the 1998 survey.

**Table 7: Restraint Use by Vehicle Type**

	Restraint Used			Total
	Yes	No	Child Restraint	
<b>Cars</b>	3507 (57.8%)	2532 (41.7%)	33 (.5%)	6072
<b>Vans/Pickups</b>	2401 (44.5%)	2983 (55.3%)	14 (.3%)	5398
<b>Sport Utility Vehicles</b>	875 (58.1%)	621 (41.2%)	11 (.7%)	1507
<b>Total</b>	6783 (52.3%)	6136 (47.3%)	58 (.4%)	12,977

Type of Roadway

Four types of road segments were eligible for inclusion in the survey, including urban and rural highways and urban and rural interstates. In order to be classified "urban" the road must pass through a city with a population of at least 5000 people.

**Table 8: Restraint Use by Road Type**

Road Type	Restraint Used		Child Restraint	Total
	Yes	No		
<b>Urban Highway</b>	1559 (48.5%)	1644 (51.1%)	13 (.4%)	3216
<b>Rural Highway</b>	3426 (49.9%)	3419 (49.8%)	21 (.3%)	6866
<b>Urban Interstate</b>	645 (57.5%)	468 (41.7%)	8 (.7%)	1121
<b>Rural Interstate</b>	1153 (65%)	605 (34.1%)	16 (.9%)	1774
<b>Total</b>	6783 (52.3%)	6136 (47.3%)	58 (.4%)	12977

Table 8 illustrates the frequency of restraint use observed on each type of road classification. Note that restraint use was highest on rural interstates. Of the 1774 observations of motorist on rural interstates, 1153 or 65% were wearing a restraint and another 16 or .9% were in a child safety seat while 605 or 34.1% were not wearing a restraint. Urban interstates had the second highest usage rate with 645 of 1121 or 57.5% of the motorists observed were wearing a restraint. A total of 3216 motorists were observed traveling along urban highways. Of these 3216, 1559 or 48.5% were wearing a restraint and 1644 or 51.1% were not wearing a restraint. The rural highway classification comprised the majority of observations (6866 out of 12,977 or 52.9%). Of

the 6866 motorists observed traveling along rural highways, 3426 or 49.9% were wearing a restraint while 3419 or 49.8% were observed not wearing a restraint.

#### In-State versus Out-of-State Vehicles

Observers recorded whether or not the vehicles included in the observation had in or out-of-state license plates. The overwhelming majority of observations were of vehicles with in-state license plates (88.9% or 11,442 of 12,870). As illustrated in Table 9, vehicles with out-of-state license plates tended to have higher rates of seatbelt restraint usage. Of the 1428 out-of-state vehicles observed, 819 or 57.4% of the motorists observed were wearing a restraint as compared to 5908 out of 11,442 or 51.6% of motorists traveling in vehicles with in-state license plates.

**Table 9: Restraint Usage Observed for In-and Out-of State License Plates**

License Plates	Restraint Used		Child Restraint	Total
	Yes	No		
<b>In-State</b>	5908 (51.6%)	5485 (47.9%)	49 (.4%)	11442
<b>Out-of-State</b>	819 (57.4%)	604 (42.3%)	5 (.4%)	1428
<b>Total</b>	6727 (52.3%)	6089 (47.3%)	54 (.4%)	12870

## **Discussion**

Results of the current survey indicate that overall restraint use has risen in South Dakota relative to the base rates established by the 1998 survey. The statewide rate established in this survey for the year 2000 was 53.35% as compared to the statewide rate of 45.70% observed in the 1998 survey. This increase can be considered substantial because nationwide seatbelt use rates have increased by only a few percentage points in recent years: 68% in 1996, 68.9% in 1998, and 71% in 2000 according to NHTSA records.

Despite the demonstrated positive upward trend in South Dakota seat belt usage, overall statewide rates fall below the national average. Particularly disturbing is the low rates of safety restraint use for children.

### Child Restraint Usage

Nationwide, the leading cause of death and disability for children over the age of one year is motor vehicle accidents (Winston, Durbin, Kallan, and Moll, 2000). According to NHTSA figures, most children killed in automobile accidents are not restrained. It is estimated that in an automobile accident, rear-facing infant seats reduce the risk of fatal injury for young children by as much as 71% while seatbelts reduce the risk of fatal injury for young children by only 45% (NHTSA, 2001). Despite these figures, many children continue to travel in motor vehicles without adequate safety restraints. In the current survey, 41.0% of children 0-4 years of age were not wearing any type of safety restraint while another 26.1% were wearing only a seatbelt without being secured in a child safety restraint.

Winston et al. (2000) investigated the safety restraint use of children between 2 to 5 years of age and motor vehicle accident severity as determined through insurance records. In particular Winston and colleagues examined the practice of prematurely moving preschool aged children from child safety restraints to seatbelts. During a one-year period (December 1, 1998 to November 30, 1999) insurance records for 15 states and the District of Columbia for one insurance company included reports for 2077 children between 2-5 years of age who were involved in motor vehicle crashes. Records indicated that 98 % of these children were restrained, but nearly 40% were restrained by a seat belt only. Winston et al. (2000) found that children wearing only seatbelts were 3.5 times more likely to suffer significant injury as compared to children in a child safety restraint.

The current South Dakota Observational Survey found usage rates of seatbelts only (no child restraint) comparable to those discussed by Winston and colleagues, for children in the age category of 0-4 years. Note that according to South Dakota law, for children over the age of 4 years or children weighing over 40 lbs, a seat belt is legally adequate for safety restraint purposes.



### Limitations and Recommendations for Future Surveys

Child Restraint Observations. The overall observed rate for children increased substantially as compared to the 1998 survey. However, observation rates remain low for persons under the age of 18 years. The low observation rate for children under the age of five may exist in part because children are more difficult to see relative to adults, particularly while in the back seat. This problem may be exacerbated by tinted rear windows. Incorporating the additional procedural process of coding data for additional children 0-4 years of age and all children in the back seat, 0-4 years of age increased observation rates for this age category substantially. However, due to the particular significance of tracking child safety restraint use, additional sampling procedures are warranted. For example, in future surveys research designers should consider planning additional observation sites at places where children are likely to be observed in residential or other slow moving traffic areas such as near day cares, schools and public libraries.

Additional Considerations. Although not included in the data recorded, anecdotally rates of seatbelt use appeared to vary as a function of both gender and advanced age. Information potentially useful for targeting low use populations might be gained by refining the data coded during the observations to include additional age categories (i.e., 18-35, 36-65, 66 or older) and to include a breakdown by gender.

Reliability. In comparing the 1998 survey rates to the 2000 survey rates it was observed that usage rates for some counties had changed substantially. These changes may indicate that usage rates changed dramatically in some counties while changing only slightly in other counties. However, it might also indicate that something in the observation procedure varied from the 1998 survey. Therefore it is recommended that a reliability check be implemented into the methodological procedure in future surveys. This might involve having a designated individual travel to several counties and sites to conduct independent observations that could be compared to those obtained by the local observers. This procedure might be particularly beneficial in counties where the usage rates changed substantially between the 1998 and 2000 surveys.

### **Conclusion**

In summary, results of the current investigation indicate a substantial increase in the statewide weighted average seatbelt use from 45.7% in 1998 to 53.4% in 2000. However, the current rate continues to illustrate areas with potential for vast improvement. Motor vehicle accidents are a leading cause of injury and fatality in all age groups. Use of a seatbelt restraint has been shown to decrease mortality and serious disability by approximately 50%. Increasing seatbelt restraint usage has the promise of dramatically improving the safety and longevity of South Dakota residents.

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**Appendix A****List of Observation Sites by Roadway Type****Urban Interstate**

<b>County</b>	<b>Road</b>	<b>Mile</b>	<b>Site #</b>	<b>Probability of Selection for County</b>
Minnehaha	29N	77	2	.31
Minnehaha	29N	98	3	.31
Minnehaha	229	3	4	.31
Minnehaha	229	5	5	.31
Minnehaha	229	7	6	.31
Pennington	90E	56	11	.18
Pennington	90E	60	12	.18
Lawrence	90	13	2	1.00
Davison	90	330	8	1.00
Davison	90	333	10	1.00
Union	29S	.98	1	1.00

**Rural Interstate**

Minnehaha	90	379	13	.19
Minnehaha	90	390	14	.19
Minnehaha	90	412	15	.19
Pennington	90E	66	13	.31
Pennington	90E	90	14	.31
Pennington	90E	98	15	.31
Pennington	90W	55	16	.31
Pennington	90W	62	17	.31
Lawrence	90	12	1	1.00
Lawrence	90E	15	3	1.00
Lawrence	90E	27	4	1.00
Lawrence	90W	12	5	1.00
Lawrence	90W	15	6	1.00
Lawrence	90W	24	7	1.00
Davison	90	319	6	1.00
Davison	90	325	7	1.00
Davison	90	332	9	1.00
Union	29N	1	2	1.00
Union	29N	18	3	1.00
Union	29N	27	4	1.00
Union	29S	42	5	1.00
Grant	29	201	16	1.00

**Urban Highway**

Minnehaha	115	84	7	.70
Minnehaha	115	87	8	.70
Minnehaha	115	88	9	.70
Minnehaha	11	79	10	.70
Minnehaha	42	363	11	.70
Minnehaha	42	367	12	.70
Minnehaha	38	365	17	.70
Pennington	16	69	2	.18
Pennington	16B	68	3	.18
Pennington	16B	70	4	.18
Pennington	79	80	6	.18
Pennington	44	40	7	.18
Pennington	44	49	8	.18
Brown	12	289	4	1.00
Brown	12	290	5	1.00
Brown	12	292	6	1.00
Brown	12E	289	8	1.00
Brown	281	193	9	1.00
Brown	281N	197	14	1.00
Lawrence	14A	9	14	.13
Lawrence	14A	10	15	.13
Davison	37	74	3	.60
Davison	37	76	4	.60
Davison	38	300	12	.60
Beadle	37	125	13	1.00
Beadle	37	127	14	1.00
Beadle	37	128	15	1.00
Hughes	14E	230	3	1.00
Hughes	14W	232	5	1.00
Hughes	14	229	6	1.00
Hughes	14	230	7	1.00
Hughes	14B	95	11	1.00
Hughes	14B	96	12	1.00
Hughes	34	209	13	1.00
Hughes	34	210	14	1.00

**Rural Highway**

Minnehaha	19	64	1	.07
Minnehaha	38	349	16	.07
Pennington	16	45	1	.10
Pennington	16A	59	5	.10
Pennington	44	87	9	.10
Pennington	44	107	10	.10
Lawrence	385	122	8	.66

Lawrence	85	28	9	.66
Lawrence	14A	29	10	.66
Lawrence	14A	35	11	.66
Lawrence	14A	37	12	.66
Lawrence	14A	41	13	.66
Lawrence	14A	41	16	.66
Lawrence	14A	50	17	.66
Brown	10	279	1	.55
Brown	10	282	2	.55
Brown	10	297	3	.55
Brown	12	309	7	.55
Brown	281	214	10	.55
Brown	281	214	11	.55
Brown	281S	185	12	.55
Brown	281N	185	13	.55
Brown	37	207	15	.55
Brown	37	208	16	.55
Brown	37	208	17	.55
Hughes	83	138	1	.69
Hughes	1804	256	2	.69
Hughes	1804	256	2	.69
Hughes	14	139	4	.69
Hughes	14	246	8	.69
Hughes	14	251	9	.69
Hughes	14	263	10	.69
Hughes	34	212	15	.69
Hughes	34	232	16	.69
Hughes	34	245	17	.69
Davison	37	62	1	.83
Davison	37	72	2	.83
Davison	37	76	5	.83
Davison	42	302	11	.83
Davison	38	302	13	.83
Beadle	14	333	1	.83
Beadle	14	354	2	.83
Beadle	14	354	3	.83
Beadle	14	363	4	.83
Beadle	14	316	5	.83
Beadle	14	326	6	.83
Beadle	14	326	7	.83
Beadle	14	331	8	.83
Beadle	28	269	9	.83
Beadle	28	283	10	.83
Beadle	28	298	11	.83
Beadle	281	117	12	.83
Beadle	37	133	16	.83
Beadle	37	145	17	.83
Union	46	365	6	.83

Union	46	366	7	.88
Union	46	380	8	.88
Union	46	371	9	.88
Union	11	9	10	.88
Union	11	23	11	.88
Union	11	35	12	.88
Union	11	35	13	.88
Union	50	423	14	.88
Charles Mix	50	337	1	.88
Charles Mix	50	329	2	.88
Charles Mix	50	314	3	.88
Charles Mix	50S	299	4	.88
Charles Mix	50N	299	5	.88
Charles Mix	50	273	6	.88
Charles Mix	1804	90	7	.88
Charles Mix	1804	120	8	.88
Charles Mix	44	298	9	.88
Charles Mix	44	305	10	.88
Charles Mix	44	306	11	.88
Charles Mix	45	27	12	.88
Charles Mix	46	277	13	.88
Charles Mix	46	288	14	.88
Charles Mix	46	290	15	.88
Grant	20	439	1	1.00
Grant	20	439	2	1.00
Grant	20	446	3	1.00
Grant	158	439	4	1.00
Grant	12	377	5	1.00
Grant	12	388	6	1.00
Grant	12	390	7	1.00
Grant	12	390	8	1.00
Grant	12	399	9	1.00
Grant	123	172	10	1.00
Grant	15	160	11	1.00
Grant	15	167	12	1.00
Grant	15	174	13	1.00
Grant	15	174	14	1.00
Grant	15	175	15	1.00
Fall River	18	62	1	.65
Fall River	18	11	2	.65
Fall River	18	12	3	.65
Fall River	18	24	4	.65
Fall River	471	7	5	.65
Fall River	471	21	6	.65
Fall River	471	27	7	.65
Fall River	89	29	8	.65
Fall River	71	1	9	.65

Fall River	71	2	10	.65
Fall River	71	7	11	.65
Fall River	71	27	12	.65
Fall River	71	35	13	.65
Fall River	385	39	14	.65
Fall River	79	26	15	.65
Fall River	385	12	16	.65
Fall River	385	13	17	.65
Tripp	53	26	1	1.00
Tripp	183S	5	2	1.00
Tripp	183S	19	3	1.00
Tripp	183N	43	4	1.00
Tripp	183N	61	5	1.00
Tripp	49	18	6	1.00
Tripp	49	27	7	1.00
Tripp	49	42	8	1.00
Tripp	18	242	9	1.00
Tripp	18	252	10	1.00
Tripp	18	252	11	1.00
Tripp	18	273	12	1.00
Tripp	44	237	13	1.00
Tripp	44	270	14	1.00
Kingsbury	25	114	1	1.00
Kingsbury	25	120	2	1.00
Kingsbury	81	116	3	1.00
Kingsbury	81	119	4	1.00
Kingsbury	81	125	5	1.00
Kingsbury	14	363	6	1.00
Kingsbury	14	365	7	1.00
Kingsbury	14	378	8	1.00
Kingsbury	14	378	9	1.00
Kingsbury	14	383	10	1.00
Kingsbury	14	387	11	1.00
Kingsbury	14	390	12	1.00
Kingsbury	14	400	13	1.00
Kingsbury	25	113	14	1.00

## **Appendix B**

Observer Manual - 2000 South Dakota Seatbelt Survey



# **Observer Manual**

**2000 South Dakota  
Seat Belt Survey**

## **INSTRUCTIONS FOR USING THE SEAT BELT OBSERVER FORM**

### **South Dakota Statewide Seat Belt Survey**

**Fall, 2000**

The Seat Belt Survey Observer Form has been designed so that information can be easily collected about seat belt use. The form allows for collection of seat belt use data for all drivers and right front passengers in non-commercial vehicles as well as children age five and under anywhere in the car. The form is constructed so that each driver and a passenger (when one is present) receive one full line of data - 22 columns across the page. The first 8 columns are used to record information about the vehicle and the occupant. The first information recorded is the vehicle sequence number and whether the vehicle is a car, a van/truck/station wagon/minivan or Sport Utility Vehicle (SUV).

**Note: The observer procedures described in this manual are identical to the 1998 manual with the exception that we will now be collecting information for all passengers who are children between 0-4 years of age regardless of their position in the vehicle. Please note the additional instructions for coding of this information later in the manual.**

The occupant information includes whether the person is a driver, or a right front seat passenger, or an additional child 0-4 years of age in the front and/or back seat; and-most importantly--whether the occupant has on a seat belt or is in a child restraint. Age of the occupant is estimated in order to determine restraint use for children and teenagers. Finally, the license plate is recorded as being either in state or out of state.

The remaining 13 columns are used for recording "demographic" information about the observation such as county, site number, time of day, and road type. The vehicle-occupant information must be recorded immediately as the Observer watches people in passing vehicles. The demographic information, however, only has to be written once on the first line of the first coding form used. When the coding sheets are processed, the demographic information will be automatically duplicated for all persons recorded during that 40-minute observation session.

## **INSTRUCTIONS**

Observers will be provided an Observer Site Schedule that will show the time and place to observe traffic over a 4-day period. An additional week is listed in case there is a need to select an alternate observation date. They will receive an Observation Site List that contains the numbers and descriptions of the observation sites. Maps of the observation sites will also be provided. Sites include road segments between mile markers that are located along urban and rural highways and interstates. Each site will be monitored for a 40-minute session during one of 6 time slots spread over the 4-day period. The observations are conducted according to the following steps.

### 1) Preparation for the Observation Session:

Observers should wear an orange safety vest issued by the SD Office of Highway Safety to increase their visibility to passing traffic. Observers should carry their observation sheets on a clipboard and use a number 2 pencil for recording information. Do not use ink or flair pens. It is very important that Observers write numbers clearly so that they can be entered correctly into the computer. Cross "7"s so that they can be distinguished from "1"s.

### 2) Arrival on Site and selection of an Observation Area:

Observers should reach their observation site a few minutes before they plan to begin the observation session. Note that scheduled time periods are 1½ hour periods and the observation session is only for 40 minutes. This will allow Observers some leeway in start and stop times. Schedule observations within the time period making sure to allow plenty of time to finish and get to the next site on time.

Before the observation session begins, the Observer should record the demographic information in columns 9 - 22 on the first row of the observation sheet. Most of the codes for the demographic information are on the top of the observation form. Information about "Road Type" is on the Site List. This information only has to be coded once for each 40-minute observation session.

Observers will then choose a position at the site that provides the best view of occupants in vehicles. For urban road sites, choose sites that allow observation of vehicles that have stopped for a red light or stop sign, or slowed for a yield sign. The best position is usually on the curb next to a right-hand turn lane on urban sites. For rural segments, intersections or junctions provide a safe yet effective observation position.

As Observers prepare to observe, they should stand at the safest possible position either on the curb or well to the side of the road which allows them a good view inside the front seat of cars/vans/trucks and sport utility vehicles which will be stopping or slowing at the site. Observers must be careful not to step into the roadway and endanger themselves as they attempt to look inside passing vehicles. It is better to be safe and guess about some information than it is to put oneself at risk for a thorough look. Do not observe in stormy weather with lightning.

### 3) Selection and Coding of the First Vehicle:

When the Observer is ready to record data, he/she will observe the first non-commercial car, mini-van, van, pickup-truck, or sport utility vehicle (SUV) to stop at the site.

**IMPORTANT: Commercial vehicles of any type (cars, station wagons, mini-vans, vans, pickup trucks, and large trucks) will not be included in the survey.**

Commercial vehicles are those with commercial license plates and/or commercial signing or lettering of any kind on the vehicle.

Information about the vehicle will then be coded. The first vehicle is assigned the sequence number "001" and marked as either a car, a truck/van/mini-van/station wagon or as an SUV. The next code indicates the position of the person in the vehicle (driver or a passenger). Then the drivers' seat belt use is coded. If there is a right front vehicle passenger, the next line of the form is used to code passenger information. This line also begins with a sequence number of "001" since it is the same vehicle. If there is a child 0-4 years of age in addition to the right seat passenger, (e.g., sitting or standing on the right front seat passenger's lap, in the center front seat), record information about the child on the next line - starting with the same vehicle number "001". If there are any children 0-4 years in the back seat, code information about each child on a separate line starting with the same vehicle number.

Observers may not always be able to record accurately all information about the vehicle. The best strategy is to record the most important information first: seat belt use and age. Then, move to other categories such as vehicle type (car versus van/pick-up versus SUV). Record the state of license plate last, skipping it if you must.

#### **4) Selection of Vehicles Throughout the Observation Session:**

##### **Cars and Vans/Trucks and Sport Utility Vehicles:**

If traffic flow is heavy (an average of more than 1 vehicle per minute), observe every other vehicle that stops or slows down. For example, after the first car or van/truck has been coded as Vehicle ID "001", the Observer should let one car or van/truck stop and leave and then code data on the next vehicle that stops as Vehicle ID Number "002". Repeat the pattern for the next session.

If the traffic flow is lighter such that less than one vehicle stops every minute, Observers should record data on every car/van/truck/SUV that stops or slows down. If a vehicle containing several children takes a lot of time to code, skip the next one or two vehicles until you are ready to code again.

#### **5) Completing the Observation Session:**

At the end of the 40-minute observation session, Observers should go to the box in the lower right corner of the first survey form used for the session and check whether every car or every other car was observed. Then, Observers should count the total number of cars/vans/trucks and Sport Utility Vehicles observed for the session. (This information is coded in the Veh Type column.) Record these totals in the lower half of the box on the first page of the forms used for this session. **Note that the sum of all vehicle types should match the highest Vehicle ID Number for the session - be careful not to count vehicles with passengers more than once.** Scan handwriting and correct unreadable numbers. The survey forms should be clipped together in correct order, and stored in a safe, dry place until they are returned to the survey supervisor.

## 6) Starting the Next Observation Session:

At the Observer's next 40 minute observation session, he/she should begin with a new survey form and the Vehicle ID numbers should begin again with "001". Demographic information for this site should be recorded on the first line of the coding sheet.

## DESCRIPTIONS OF CATEGORIES AND CODES

Observers should use the codes exactly as described. The most common mistake is to forget to fill in "0"'s for double or triple digit codes. For example, for November 3rd, do not record a "3" in the first column of the Day columns, instead a code of "03" is printed in both columns. See Appendix A for an explanation of some sample coding.

### Vehicle ID Number

During each observation session, the Observer will assign a sequential "Vehicle ID number" to each vehicle that is sampled (selected for observation). The sequential ID's should start with "001" each session. ID numbers for an observation session in heavy traffic will probably run from 001 through 070. The same Vehicle ID Number is assigned to the driver of a vehicle and the passenger. In other words, if a vehicle has only a driver, only one line of the coding form will be used for the vehicle. If the vehicle has a driver and a passenger, two or more lines of the coding form will be used for the vehicle and all will have the **same** Vehicle ID Number. Each child 0-4 years of age in addition to the right front passenger will be coded on a separate line with the same vehicle code.

### Veh Type

Non-commercial passenger cars are coded as "1". All other non-commercial vehicles (mini-vans, station wagons, vans, pickup trucks, etc.) except sport utility vehicles are coded as "2". Sport Utility Vehicles of all types are coded as "3". Sport utility vehicles are being coded separately for future research purposes. **Remember, commercial vehicles of any type are not to be included in the survey.**

### Drive/Pass

Drivers are coded as "1". Passengers of any age, child or adult, in the right front seat are recorded as "2". Children (0-4 years) in the front, but not sitting alone in the right front seat (e.g., sitting or standing on the lap of the right front passenger, or sitting or standing in the center) are recorded as "3". Children (0-4 years) anywhere in the backseat are recorded as "4".

## Belt Use

As soon as a vehicle stops, Observers should immediately determine whether the driver and right front passenger or any children under the age of 5 are wearing a safety restraint. A "1" means safety equipment was present. A "2" means it was not present. A "3" is used for the special case when a child passenger is in a child restraint device or car seat.

For all vehicles (cars, mini-vans, vans, station wagons, pickups and sport utility vehicles), proceed as follows:

Restraint use is determined by the **shoulder strap of the seat belt or by the use of a child restraint**. Using a shoulder strap as an indicator is a procedure that the National Highway Traffic Safety Administration has standardized for seat belt surveys across the country. Although it may not be 100% accurate because some cars have lap belts and no shoulder strap, using shoulder straps as indicators has been determined to be more accurate in the long run than trying to see inside of cars to check for lap belts.

For the driver code "1" if a shoulder strap is in use. Code "2" if the shoulder strap is not in use.

If there is a right front passenger of any age, start a new line of code with the same vehicle sequence number used for the driver on the previous line. For the right front passenger code "1" if a shoulder strap is in use. Code "3" if a child restraint (car safety seat, infant carrier, special harness to supplement the standard lap/shoulder belt, etc.) is in use. Code "2" if NEITHER the shoulder strap nor a child restraint is in use.

If there is a child 0-4 years of age in the front seat **in addition** to the right front seat passenger, start a new line of code with the same vehicle number used for the driver and passenger in the previous lines. Code "3" if a child restraint is in use. Code "2" if a child restraint is not in use. Code "1" in the event that the child 0-4 years of age is restrained by only a shoulder belt, but not a child restraint. If there is a child or children 0-4 years of age in the backseat, start a new line of code with the same vehicle number. Start a new line of code for each additional child 0-4 years of age using the same vehicle code.

## Age

Observers should pay special attention to judging the age of child occupants.

If the occupant is an "infant" to 4 years old, code "1".

If the occupant appears to be 5 to 13 years old, code "2".

If the occupant appears to be 14 to 17 years old, code "3".

If the occupant appears to be 18 years old or older, code "4".

If it is absolutely impossible to determine the age of a vehicle occupant, code "5" for unknown. You should **not** use this category when you are uncertain about the exact age of an occupant, e.g., you're not sure if an occupant is 13 or 14. If you are uncertain, make your best guess. The unknown category is reserved for only those cases when you can not determine age at all, e.g., large hat obscuring face of vehicle occupant.

#### Lic State

This column is used to indicate whether or not the license plate on the observed vehicle is from South Dakota or another state. Code "1" for a South Dakota plate (regardless of county of origin). Code "2" for any out of state plate. Code "3" if you absolutely could not determine whether or not the plate was in-state or out of state.

THE REMAINING CODES ARE RECORDED ONLY ONCE ON THE FIRST LINE OF THE FIRST FORM USED AT A SITE.

#### County

Code the appropriate number for the thirteen counties listed on the Observer Form.

#### Site

Observers will be given an "Observation Site List" which will list all observation sites in the county and a two-digit Site Number for each site. Observers should code the appropriate Site Number for each 40-minute observation session.

#### Time

The Time category refers to the time of day that the observation session is scheduled.

- 1 = 7:30 to 9:00 A.M.
- 2 = 9:00 to 10:30 A.M.
- 3 = 10:30 to 12 noon
- 4 = 12 noon to 1:30 P.M.
- 5 = 1:30 to 3:00 P.M.
- 6 = 3:00 to 4:30 P.M.

#### Month/Day/Year

Record the full date of the observation day --including "0"s --in these six spaces. For example, November 7, 2000 would be recorded as "11 07 00".

### Observer

Each Observer will enter his or her first and last initial initials on the coding sheet for identification purposes.

### Road Type

The Observation Site List provided to all observers will have a "Road Type" code for each site. Four road types will be sampled. Road segments within and on the border of cities have been designated as "Urban" and all other segments are designated "Rural". Urban Highways are coded as "1". Rural Highways are coded as "2". Urban Interstates are coded as "3" and Rural Interstates are coded as "4".

#### \*\*\*\*\* IMPORTANT \*\*\*\*\*

**If you have any questions about this manual or any of the survey procedures, call Carryl Baldwin at (712) 274-8733 ext. 1425 during daytime hours or (605) 624-9451 in the evenings. Questions may also be directed to Cindy Struckman-Johnson in the Human Factors Lab at the University of South Dakota at (605) 677-5295 or (605) 677-5098. If neither Cindy nor Carryl is available, please leave a message with a number and a good time to call you and we will return your call.**



## APPENDIX A

### SEAT BELT SURVEY FORM EXAMPLES

The last page of this appendix contains an example of a partially completed survey form. It contains coding for 5 vehicles at a hypothetical observation site in Brown County. What follows is an explanation of why the codes shown on the sample form have been used. These examples have been selected to demonstrate many of the things you will commonly encounter while observing as well as some things you need to be careful about.

#### **Vehicle 001 - Driver Only**

There is only a single line with the vehicle ID 001, so this vehicle did not have a passenger. Note that vehicle 1 is coded "001" not "1". The vehicle type is coded as "1" so this vehicle must have been a non-commercial car. The third thing that is coded is "1" for Drive/Pass/Extra. This line of entries describes a driver. The next column indicates the driver's belt use. Since this is coded as "1", a shoulder belt was in use. Age is coded "4" meaning that the driver is 18 years of age or older. The "1" in the Lic State column means the vehicle plate was from South Dakota.

The remaining columns of information apply to all the vehicles coded on this sheet, so only one line of data needs to be entered for the entire sheet. County is coded "07" since this example takes place in Brown County. Note that the 7 is crossed so the data entry person will have no difficulty telling the difference between 1's and sloppy 7's. The next 2 columns are the code for the particular site within Brown County. Each observer will be provided with a list of codes for all sites at which he/she will be observing. Time is coded as "2" meaning that the observation is taking place between 9:00 and 10:30 A.M. The next six columns code the month, day and year of the observation in that order. Note that for November 2<sup>nd</sup>, the 2<sup>nd</sup> day of the month is coded "02" not just "2". The next two columns are for the first and last initials of the observer. In this example, Donna Smith was observing so "D" and "S" are recorded in these two columns. The next column indicates the type of road on which the observation is taking place. Since this observation site is a highway that runs through a city, the correct road type is urban highway and code "1" is entered. Although the road type will be fairly obvious for each site, the road type code will be identified on the Observer site list so there will be no possibility for confusion.

#### **Vehicle 002 - Driver fright front passenger (Child –0-4 years)**

Vehicle 002 is a car and has two lines of code and a "3" in the Veh Type column indicating an SUV with a driver and passenger. The driver line indicates a shoulder belt was used (Seat belt use code = "1") and that driver was at least 18 years old. The car has South Dakota plates.

The passenger line for Vehicle 002 indicates that the passenger was a child 0-4 years of age in the right front seat (Drive/Pass/Extra = "2") in a child restraint (Seat belt use = "3").

It is extremely important to the survey that child restraint use be coded correctly. If a passenger is **USING** a child restraint. "3" is the correct code for the Belt use column. Do **NOT** code "1" (shoulder belt used) even if a shoulder belt is being used to hold the child restraint in place. Finally, do NOT use code "3" if an empty child restraint is present in the front seat. The age is coded as "1" indicating that the passenger was between 0 and 4 years of age. The final column for the Vehicle 002 passenger line repeats the South Dakota license plate code "1".

**Vehicle 003 – Driver /Right front passenger/ Child 0-4 in front/ Non-recorded older child**

Vehicle 003 has three lines of code indicating a driver and more than one passenger. The Veh Type column for vehicle 003 is coded as "2" indicating that the vehicle was a pickup, van or station wagon. The driver line (code "1" in Drive/Pass/Extra) has an entry for Belt Use indicating that the driver was not wearing a seat belt (code = "2"). Note that the same code value is used to indicate a vehicle occupant is not wearing a shoulder harness or using a child restraint for all vehicle types. The remaining codes for the driver of vehicle 003 indicate that the driver is 18 years old or older and that the pickup, van, or station wagon had out-of-state license plates, coded "2".

The next line of information for the first passenger of vehicle 003 duplicates the Vehicle ID Number and Veh Type codes. The Drive/Pass column is coded "2" to indicate a right front seat passenger. The Belt Use column is coded "1" indicating that the passenger was wearing a seat belt. The next column of the passenger information records age. Code "5" is entered in this example. Code "5" stands for "Unknown". In this example, the age is unknown because the child on her lap blocked the passenger's face from view. This is one of the few situations in which code "5" is appropriate. Code "5" should not be used in cases when you are not sure whether a person is 4 or 5, 13 or 14, or 17 or 18. If you are not sure about age category, make your best guess. Use code "5" only in those cases when you can't tell age at all. The final column of the first passenger data duplicates the out of state license code from the previous line for this vehicle.

The third line of information for vehicle 003 again duplicates the Vehicle ID Number and the Veh Type codes. The Drive/Pass column is coded as "3" indicating that there was a child 0-4 years of age in the front seat in addition to the right front passenger coded on the previous line. (In this case the child 0-4 years of age had been seated on the right front passengers' lap.) The Belt Use column is coded as "2" indicating the child was not in a child restraint device. The Age column indicates that the child was 0-4 years of age. The Lic State code duplicates the "2" indicating an out of state license plate as recorded on the previous two lines for vehicle 003.

A fourth child was present in the center of the seat. However, no information was recorded for this child since the child was estimated to be in the age category of 5-13 years.

**Note:** When more than two lines of code are used for the same vehicle, the age column will always be coded as a "1" indicating a child 0-4 years of age, and the "Drive/Pass or Extra" column will always be coded as either a "3" or a "4" to distinguish whether the 0-4

year old child was in the front or back seat. No information is recorded for persons aged 5 years or older unless they are either the driver or a passenger in the right front seat.

#### **Vehicle 004 – Driver /Two backseat passengers (0-4 years)**

Vehicle 004 is a car with three lines of code and a "1" in the Veh Type column indicating a car with a driver and at least two passengers. The driver line indicates a shoulder belt was used (code "1") and that driver was at least 18 years old. The car has South Dakota plates.

The second line for Vehicle 004 indicates that a child 0-4 years of age was seated in the back seat (passenger code 4) in a child restraint (code = "3"). The age is coded as "1" indicating that the passenger was 0-4 years of age. The final column for the Vehicle 004 passenger line repeats the South Dakota license plate code "1" .

The third line for Vehicle 004 indicates that a second child (0-4 years of age) was present in the back seat (Drive/Pass or Extra is coded as "4"). This child 0-4 years old was not in a child restraint as indicated by the Seat Belt Use code "2". Age is coded as "1" and the License plate information is repeated as "1" indicating a vehicle with South Dakota license plates as recorded on the previous two lines.

#### **Vehicle 005 – Driver /Backseat passenger (0-4 years)**

Vehicle 005 has two lines of code. A "1" in the Vehicle Type column indicates this was a car. The driver was wearing a seat belt (Seat belt use code = "1" ) and was between 14 and 17 years of age (Age code = "3"). The vehicle had South Dakota license plates.

The second line of code for vehicle 005 repeats the vehicle type information. The Drive/Pass/Extra code of "4" indicates that there was a child 0-4 years of age in the back seat. The Seat belt use code is "1" for this passenger indicating that the child 0-4 years was wearing a shoulder belt but was not in a child restraint device.

#### **Observation Session Summary Box**

The observation session summary box in the lower right hand corner of the sample form would be completed if this were the first page of information collected at a site. Since this example starts with Vehicle ID Number 001, this is a first sheet. Although the information is somewhat unrealistic for an entire observation session (traffic volume would likely be much higher), it is correct for the vehicles shown on this sheet.

The upper half of the box indicates whether every vehicle was observed (normal traffic conditions) or every other vehicle was observed (heavy traffic conditions). The "Every Car Observed" line is check since traffic was obviously light enough for this strategy.

The lower half of the box indicates the total number of vehicles observed during the 40-minute observation session. In this case, there were 3 cars, 1 sport utility vehicle, and 1 pickup/van/ or station wagon for a total of 5 vehicles. Note that these numbers represent ALL vehicles observed during the entire 40-minute observation session that normally will be recorded on several sheets. At the end of an observation session, you will need to count vehicles on ALL forms used during that session, but you should only enter the totals on the first sheet.

The lower box is used for recording a verbal description of the actual location used for observation. Terminology similar to that used on the site list is expected. For this example the observer was located at the interchange of Hwy. 281 and Hwy. 12 observing all traffic turning onto Hwy. 281.

The survey summary box and the location description box will be blank on all observation sheets except the first one used at each site.

**Remember:** Use a number 2 pencil so that you may erase and clarify coding information written unclearly when the observation period is over. Information for the driver should always be coded first followed by an additional line with the same vehicle number for the right front passenger and any additional passengers between the ages of 0 and 4 years.

# South Dakota Seatbelt Survey Form

## Vehicle Type

Car = 1  
Pickup/Van = 2  
Sport Utility = 3

## Driver / Passenger/Extra

Driver = 1  
Right Front Passenger = 2  
Extra Child Front = 3  
Child Rear = 4

## Seatbelt Use

Used = 1  
Not Used = 2  
Child Restraint Used = 3

## Age

Infant to 4 = 1  
5 to 13 = 2  
14 to 17 = 3  
18 or over = 4  
Unknown = 5

## License State

South Dakota = 1  
Other State = 2  
Unknown = 3

## County

Minnehaha = 01  
Pennington = 02  
Brown = 03  
Lawrence = 04  
Davison = 05  
Beadle = 06  
Hughes = 07  
Union = 08  
Charles Mix = 09  
Grant = 10  
Fall River = 11  
Tripp = 12  
Kingsberry = 13

## Site Number

Check County  
Site

## Time

7:30 - 9:00 am = 1  
9:00 - 10:30 am = 2  
10:30 - noon = 3  
noon - 1:30 pm = 4  
1:30 - 3:00 pm = 5  
3:00 - 4:30 pm = 6

## Road Type

Urban Highway = 1  
Rural Highway = 2  
Urban Interstate = 3  
Rural Interstate = 4

Vehicle ID Number	Veh Type	Drive Pass or Extra	Seat Belt Use	Age	Lic State	County	Site Number	Time	Month	Day	Year	Observer	Road Type
001	1	1	1	4	1	07	03	2	1	0	2	0	5
002	3	1	1	4	1								
002	3	2	3	1	1								
003	2	1	2	4	2								
003	2	2	1	5	2								
003	2	3	2	1	2								
004	1	1	1	4	1								
004	1	4	3	1	1								
004	1	4	2	1	1								
005	1	1	1	3	1								
005	1	4	1	1	1								

## Check One

Every vehicle observed ☒

Every other vehicle observed \_\_\_\_\_

Total vehicles observed in 40 minutes 5

Describe your observing location at this site:

Intersection of 281 & 12 - Stopped on the North corner by Stop sign & watched traffic turning onto 281



## Appendix C

### Computatation of Mean Seat Belt Use for South Dakota

The computation of the mean seatbelt use for in South Dakota was a three-stage process. Stage 1 consisted of computing mean seat belt use for each road type in each county. For purposes of this calculation, only drivers and right front seat passengers were considered to retain compatibility to 1998 values and Federal reporting requirements. In this computation, the vehicle miles traveled value (VMT) for a particular site was computed by averaging the VMT values for each of the subsegments in the road segment the selected site represented. These VMT values were then used to compute a weighted average for all sites for a particular road type in a particular county. This weighted mean seatbelt use rate for a particular road type in a particular county is designated

$\hat{P}_{ij}$  where i denotes road type (from 1 to 4) and j denotes county (from 1 to 13).

The second stage of the computation consisted of computing weighted means for each road type across counties based on the vehicle miles traveled (VMT) on that road type in each county and on the sampling weight for the county based on probability of selection for surveying for that county. The mean seatbelt use for a road type is

$$\hat{P}_i = \frac{\sum_{j=1}^{13} W_{.j} V_{ij} \hat{P}_{ij}}{\sum_{j=1}^{13} W_{.j} V_{ij}}$$

Where  $\hat{P}_i$  = the seat belt use estimate for road type i

$W_{.j}$  is the county weight for county j (1 for Minnehaha and Pennington, 31/11 for the remaining 11 counties)

$V_{ij}$  is the VMT for road type i in county j

$\hat{P}_{ij}$  is the seatbelt use rate estimated for road type i and county j in stage 1.

The final stage of the estimate consisted of computing the weighted average of the across county road type estimates for a statewide estimate. Weights were based on the proportion of the state's VMT on each road type.

The formula for computing the statewide estimate is

$$\hat{P} = \frac{\sum_{i=1}^4 V_i \hat{P}_i}{\sum_{i=1}^4 V_i}$$

Where  $\hat{P}$  = the statewide seat belt use estimate

$V_i$  is the proportion of VMT for road type  $i$  in the state

$\hat{P}_i$  is the rate estimated for road type  $i$  in the state stage 2.

In the 1998 South Dakota Survey, the following values were obtained

Urban Highway:	$w_1 = 0.18323$	$\hat{P}_1 = 46.35$
Rural Highway:	$w_2 = 0.44819$	$\hat{P}_2 = 54.81$
Urban interstate:	$w_3 = 0.05521$	$\hat{P}_3 = 54.08$
Rural interstate:	$w_4 = 0.31336$	$\hat{P}_4 = 55.24$

Thus, statewide seat belt use is estimated as **53.35%**.

### Computation of Variance and Confidence Bounds for Mean Seat Belt Use for South Dakota

Computational formula for the variance of  $\hat{P}$ , using the terms as defined in the computation of the weighted use estimate above, is

$$Var(\hat{P}) = \frac{\sum_{i=1}^4 \sum_{j=1}^{13} (W'_{ij})^2 * (\hat{P}_{ij} - \hat{P})^2}{n^* - 1}$$

The  $W'_{ij}$  in the formula are weights applied to the deviations based on the formula below

$$W'_{ij} = \frac{W_{.j} * V_{ij}}{\sum_{i=1}^4 \sum_{j=1}^{13} W_{.j} W_{ij}}$$

where  $n^*$  = the number of county-road type groups

Using these formulas the variance of  $\hat{P}$  is 0.252. The sampling error is then 0.502 percent.

Now, the 95% confidence bounds can be computed as the (statewide mean) +/- (1.96)(0.502).

Thus, the 95% confidence bounds on our mean estimate are:

$$53.35 \pm (1.96)(0.502) \text{ or } p(52.37\% < \text{Statewide Use} < 54.34\%) = .95$$